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# GLAZE-WORK[1]

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Just how long the process of glazing has been in use is not known. Since pottery claims its greatest antiquity in Egypt, it is quite probable that the same may be claimed for the process of finishing the ware. The Egyptian explorer, Dr. Petrie, found evidences of its dating back before the time of Abraham, a period of nearly four thousand years.

The Egyptian glazed ware was of a sandy, porous body covered with an alkaline glaze. The ancient potters of India and Persia employed *engobe,* a coating of a white, flinty material, over a colored body upon which underglaze colors were painted, the whole being covered with a transparent alkaline glaze. Most of the ancient glazed ware—the Indian, Damascene, Rhodian, and Persian—is *engobe,* each having its beautiful and characteristic effect. All have transparent, bright glazes, supposed to have been made principally of soda and lime with quartz or silica. Different effects and brighter colors were obtained with the alkaline glazes from those produced by the lead glazes so much used today. On the other hand, the lead glazes are more easily handled and surer of results. Cheaper methods began to be sought for eventually, engobe was abandoned, and the processes which produced unique and most fascinating wares became a lost art. Fortunately tin, which was introduced into glazes later on, contributed a certain pleasing and singular quality to the glaze. It was the opaque quality, the highest form of which is found in the Delft ware of the sixteenth century. The decorations are painted over the glaze before the glaze is fired.

The inspiration of these old pieces brought down to us is such that the artist potter longs to find a process whereby he

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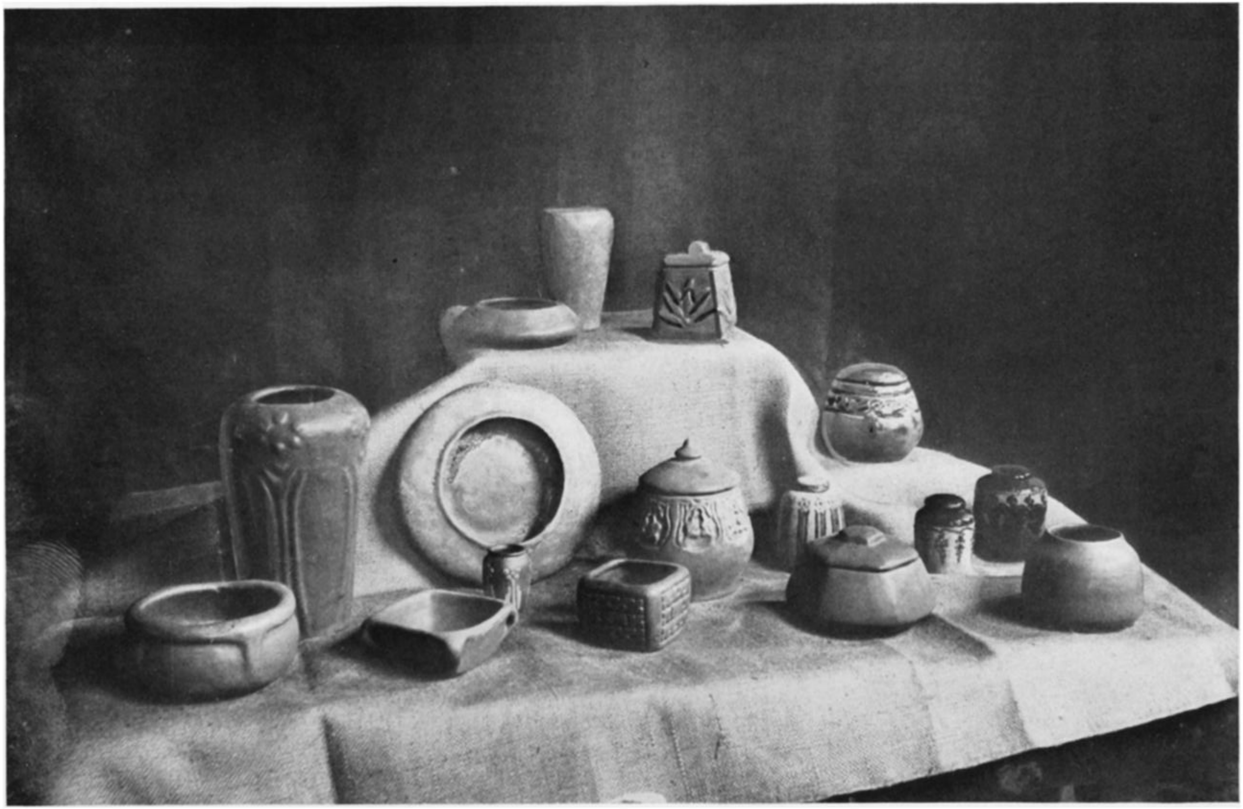
[1] This article is based upon work done in the New York School of Ceramics under Professor Charles F. Binns.

PLATE I



POTTERY DONE IN MATT AND TRANSPARENT GLAZES

By Members of a College Class

may reproduce their effects. The empirical method was the method of the ancients. This resulted in receipts which are really of little or no value now since their ingredients have become unknown, some of them having belonged only to certain localities where they were used.

Ceramists have been endeavoring to get away from this method and to secure a method by which desired results may be prescribed on paper. Although absolute certainty as to results is impossible, because of physical properties that sometimes influence the mutual action of one material upon another, making a difference in the fineness of results, the relative contents of materials may be prescribed. This is done by the use of equivalents.

The use of equivalents assumes the construction of a molecule of glaze containing acids and bases, and we make our division of glazes according to the acids and bases contained: first, silicates; second, boro-silicates containing boric acid.

With this classification, all glazes being silicates, they are named according to their bases, or to the predominating base, if more than one base is contained.

There are three parts to the constitution of a glaze:

| Base | Intermediate | Acid |
|---|---|---|
| $RO$ | $R_2O_3$ | $SiO_2$ |

The rule in glazes is to take the sum of the bases, or fluxing elements whose formula is of the type RO, such as lime ($CaO$), potash ($K_2O$), soda ($Na_2O$), lead ($PbO$), zinc ($ZnO$), etc., as unity; to gather the elements whose type-formula is $R_2O_3$ into an intermediary group—for example, alumina ($Al_2O_3$), iron ($Fe_2O_3$); and the third group of the acids, silica and boracic.

$$\begin{array}{ll} \begin{array}{r}\text{Formula for the}\\ \text{body of a glaze}\end{array} & \left\{\begin{array}{l} .50\ \mathrm{PbO} \\ .35\ \mathrm{CaO} \\ \underline{.15\ \mathrm{K_2O}} \end{array}\right\} \begin{array}{c} \mathrm{Al_2O_3} \\ .35 \end{array} \Big\} \begin{array}{c} \mathrm{SiO_2} \\ 1.484 \end{array} \\ \text{Sum of bases} & \quad 1.00 \end{array}$$

There are various considerations as to what bases shall be put into a glaze—the body, fire, and composition. Barium is harder to fire than calcium. In order to lower the fusibility of the glaze .1BaO may be substituted for .1CaO. The increase of PbO or the introduction of certain oxides of the heavy metals reduces the melting-point of the glaze. Zinc oxide will sometimes improve certain colors of a glaze, if used sparingly, otherwise it would impair the brilliancy of the glaze. It does not produce color, but it is very important in that it directs color. But, whatever the bases, their sum must always be unity.

The transfer of a formula into a common weight mixture is called translating. This is of greatest importance.

The above formula translated into a glaze mixture.

| | |
|---|---|
| White Lead | 129.00 |
| Whiting | 35.00 |
| Spar | 83.55 |
| Calcined Kaolin | 44.40 |
| Flint | 11.04 |
| Batch weight in 302.99 parts or grams | 302.99 |

From 1 to 3 per cent. of the metal oxides must be added to the batch weight to give color to the glaze; only 1 per cent. is used for the stronger oxides such as cobalt or copper.

A glaze must be compounded of insoluble ingredients. It is first ground in water, or blunged, so as to produce evenness. If a piece has to be handled much, 1 or 2 per cent. of soluble material—used purely for its physical properties for cementing—is added to bind the glaze. Many difficulties would arise if there were no way of making soluble material insoluble.

*Fritting,* also called *fretting,* takes its name from *fritt* which originally meant a conglomeration by fire; cintered by fire. It is a preliminary operation by means of which soluble substances are rendered insoluble, and infusible substances are rendered fusible. According to whether or not glazes contain a fritt they are named *raw* or *fritt glazes.*

In raw glazes we are limited to insoluble materials. They are composed of the following: kaolin, flint, feldspar, whiting, white lead, sometimes red lead, zinc oxide, and barium carbonate. They range from the red lead to the porcelain glaze with a high percentage of silica and alumina. The more or less opaque or rather translucent quality characteristic of matt glazes is due to the content of a high percentage of alumina, the greater part of which is held in supension, giving the glaze its peculiar matt quality. An increase of alumina in a glaze noticeably diminishes fusibility.

A very great variety of effects is possible with simple raw glazes, and for all public-school work the lower-temperature glazes are most practicable.

It is not too much to hold that in no other craft is the creative element so strong as in that of clay-working—the joy that comes with seeing the clay take form in one's hands is unlimited. Then, when one has done all that is possible for him to do with it, there is still the enchantment of the fire. The desire to abandon it never comes, if you have once entered the field of ceramics.